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(54) **Portable electronic computer with removable disk drive.**

(57) A computer 31 comprises a keyboard 28, and a base 22 with a housing 201 for accommodating either a floppy disk drive 52 or part of an external power supply 75 which can be connected to the mains. When the power supply 75 is fitted in the housing 201, a sensor 205 prepares a reduced output power state. The keyboard is mobile, and there is a hard disk drive 49 which can be removed by raising the keyboard from its operating position.

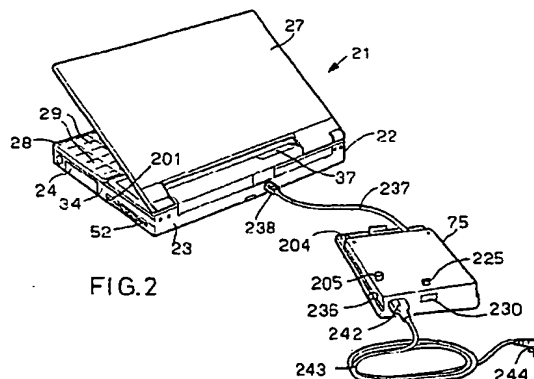


FIG. 2

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BACKGROUND OF THE INVENTION

This invention relates to a portable electronic computer comprising a base with an electronic unit for controlling and managing the computer's functions, a housing for accommodating a disk drive for reading and writing disk memory, and which can be supplied by an external power supply.

From European Patent Application No. EP-A-O 426 414, a portable computer of this type is known in which another unit, for example a modem, can be inserted instead of the disk drive. This computer can be supplied from the mains through an external power supply which requires appropriate means of transport. It is therefore not easy to handle and it is cumbersome during transport, or of limited range, in which case the operator renounces the external power supply.

From patent US-A-4,926,365, a portable computer is known in which the disk drive housing is located at the top of the base, behind the area occupied by the keyboard. This is possible because it is of the "Laptop" type (390 x 300 mm), but cannot be adopted when the computer is of the "Notebook" or "Ultra portable" type.

SUMMARY OF THE INVENTION

A preferred embodiment of the present invention provides a portable computer of very small dimensions which can be supplied from the mains, and/or which can accommodate a removable disk drive.

The invention is defined in the appended claims to which reference should now be made.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of the invention will now be described in detail, by way of example, with reference to the attached drawings in which:

Fig. 1 shows a perspective view of the rear right of a portable computer embodying the invention;

Fig. 2 shows a perspective view of the rear right of another configuration of a computer embodying the invention;

Fig. 3 is a perspective view of the base of the computer of Fig. 1;

Fig. 4 shows a perspective view of the base of the computer of Fig. 2, in a particular stage of operation;

Fig. 5 is a block diagram of the computer of Fig. 1;

Fig. 6 shows a block diagram of the detail in Fig. 5;

Fig. 7 is a functional diagram of the detail in Fig. 6;

Fig. 8 shows a partial frontal view of a detail in Figures 1 and 2;

Fig. 9 is a perspective view of another detail of Fig. 2;

Fig. 10 is a partial plan view of the details in Fig. 4;

Fig. 11 represents a partial front view of the computer of Fig. 1 in a certain stage of operation; and

Fig. 12 shows a cutaway view of details of Fig. 11.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

With reference to Figures 1-12, the portable computer, indicated generally as 21, comprises a base 22 on which a cover 27 with a monitor 26 is hinged. An electronic unit 23 is housed in the base 22 and this manages the computer's functions. A keyboard 28 on the top of the base 22 controls the electronic unit 23, by means of the keys 29.

The base 22, the shape of which is virtually parallelepiped, has a top 55, a bottom 31, a front wall 32, a rear wall 33, a right side 34 and a left side 36. A monitor 37 on the base 22 displays symbols indicating the computer's operating states.

The electronic unit 23 comprises a central unit (CPU) 41 and a set of components, comprising RAM memories 44 and a PROM memory 46. The RAMs 44 contain instructions and data in a volatile state, and the memory 46 contains the operating system's programs in a permanent state.

There is also a hard disk drive (HDD) 49 for exchanging data with the electronic unit 23. The drive 49 can be housed in a housing 51 located at the top of the base 22. The computer can also comprise a disk drive 52 for reading and writing on a removable disk, for example a magnetic floppy type.

A structure of this type is described in European Patent Application No. 93310505.8 in the Applicant's name. The dimensions of the base 22 are preferably, but are not limited to, 217 x 280 x 43 mm, which in plan view correspond to A4 size for computers known as "Notebook" computers. The computer 21 can store in memory and reproduce text and speech and, for this purpose, has a loudspeaker 71 on the level 55 of the base 22 and a microphone 25 (Fig. 5) on the cover 27, connected to the electronic unit 23.

The keyboard 28 is housed in a thin parallelepiped container 57, hinged on the median of the base 22 by means of a flexible hinge 60. The keyboard can assume a working position, which may be observed in Figure 1, in which it is superimposed on the top level 55, or an access position, which may be observed in Figure 11, in which it permits access to a surface 56 which is lower than the level 55.

A rechargeable battery pack 58 is housed in a housing 59 in the level 56 for supplying the unit 23 through a control circuit 61. When the keyboard 28 is in the access position, it permits access to the disk drive 49 and the battery pack 58.

The base 22 (Figs. 1-11) comprises a parallelepiped housing 76 on the right side 34, below the low level 56, for housing a removable plotter 24.

The computer 21 can be supplied by an external power supply 75, both for operation and for recharging the batteries inserted in the seating 59, through the circuit 61.

In this embodiment of the invention, the base 22 has a housing 201 for accommodating either the disk drive 52 or an insertable part 202 of the external power supply 75. The housing 201 is basically parallelepiped in shape and is located in the bottom 31 of the base 22, at the rear, so as to occupy, in section, about one quarter of the surface of the bottom 31. The part 202 is parallelepiped in shape and is adjacent to a part 203, basically trapezoidal in section, which projects from the housing 201 when the power supply is inserted in the housing 201, in order to allow the computer to assume an angled position in relation to a plane of support, as may be observed in Figure 1. The power supply 75 also includes an extension 204 which can be extracted from the projecting part 203, and together with the bottom 31, in an area adjacent to the housing 201, improves the support stability of the computer. A sensor 205 projecting from the part 202 operates with the bottom of the housing 201 and a microswitch 210.

The sensor 205 consists of a lug on the insertable part 202, which is connected to a lever 233 which rotates on a hinge 234 of the power supply 75, and which works together with the microswitch 210.

The disk drive 52 is basically parallelepiped in shape and it comprises a front wall 226 with holes 217, which supports a series of disk contacts 227.

The housing 201 is delimited by the rear wall 33, an inner wall 206 parallel to the wall 33 and an inner wall 207, and is open on the right side 34. The walls 33 and 206 both have a slot-shaped opening 208 open at the top which matches a pin 209 projecting from lateral walls of the disk drive 52, or a pin 236 projecting from the side walls of the power supply 75.

The inner wall 207 comprises a compartment 213 for accommodating a mobile support 214 with two projecting guide pins 216, which fit into the holes 217 of the disk drive 52 to guide the disk drive 52 during assembly. The support 214 houses a rubber component 219 with projecting lugs 221, which match a set of contacts 222 attached to the support 214 and connected to the electronic unit 23. A leaf spring 223 normally holds the mobile support 214 against the wall 207.

To fit the disk drive 52 in the computer 21, the disk drive 52 is positioned at an angle in the housing 201 and the front wall 226 is inserted towards the inner wall 207, engaging the guide pins 216 in the holes 217 while continuing to push; the disk drive 52 makes the mobile support 214 slide backwards against the action of the leaf spring 223. When the pins 209 are level

with their respective slots 208, the disk drive 52 can be lowered and released. Because of the action of the leaf spring 223, the pins 209 slide in the slots 208 and lock the disk drive 52.

The disk drive 52 also includes a flexible plate 228, which acts against an edge 229 of the bottom 31 when the disk drive 52 is correctly inserted in the housing 201. Any accidental impacts or blows are controlled by the plate 228 and prevent the drive 52 becoming disengaged from the housing 201. The action of the component 219 ensures a perfect electrical contact between the contacts 222 and contacts 227.

To dismantle the disk drive 52, the flexible plate 228 is lowered and released from the edge 229, the drive 52 is pushed inwards against the action of the leaf spring 223 until the pins 209 line up with the openings of the respective slots 208, and the drive 52 is lifted and released from its slot.

Alternatively the external power supply 75, which may be observed in Figure 1, may be partially inserted in the housing 201. In the insertable part 202, the power supply 75 comprises a projecting guide 231, which has two holes 232 for accommodating the guide pins 216 of the mobile support 214. The power supply 75 also has a hook 225 controlled by a key 230 which engages in a slot 235 on the bottom of the housing 201, when it is in the locked position, to prevent accidental unlocking.

The power supply 75 is fitted in the housing 201 in the same way as the disk drive 52. The power supply 75 is positioned in the housing 201, it is pushed until the pins 216 of the mobile support 214 engage in the holes 232 and the pins 236 are aligned with the slot 208; the power supply is then lowered, allowing the leaf spring 223 to move it backwards, locking the pins 236 against the bottom of the slot 208.

In the locked position, the sensor 205 is pushed inwards, and it inclines the lever 233, activating the microswitch 210. The extension 204 is then pulled out so that together with the bottom 31 of the computer 21, it improves the support stability of the computer 21 on the work surface, as shown in Figure 3. For the electrical connections to the computer and the network, the power supply 75 has a cable 237 on the side of the extractable extension 204, which ends with a plug 238 and, on the opposite side, a plug 241. The plug 238 can be inserted in a socket 239 of the base 22 and the plug 241 can be connected to a socket 242 of a cable 243, on the other end of which there is a plug 244 for the mains supply.

The disk drive 49 preferably uses a 2.5" magnetic disk and is housed in a parallelepiped container. It can be connected electrically and in a removable manner with the electronic unit 23, by means of connectors of a known type which are not shown on the drawings. The housing 51 is also parallelepiped and is adjacent to the housing 59.

The computer 21 comprises a microswitch 252

which functions together with an extension 253 of the container 57 in order to detect the working position of the keyboard 28. The flexible hinge 60 is mounted between an edge of the container 57 and a step 254 of the base 22. The step 254 has a hole 256, and a flexible plate 257 aligned with the hole 256 can function together with the microswitch 252. When the keyboard is in the working position, the extension 253 penetrates into the hole 256 and by means of the plate 257 enables the microswitch 252. The movement of the keyboard 28 towards the removal position makes the extension 253 come out of the hole 256 and disables the microswitch 252.

The basic program of the electronic unit 23 renders the disk drive 49 operative only when the microswitch 252 is enabled. The movement of the keyboard to the removal position disables the microswitch 252 and activates a save routine in which the contents of the RAMs 44 are saved in the disk drive 49 and the drive 49 is then immediately set to a removal configuration for safe removal from the housing 51.

The removal of the drive 49 from the housing 51 is also facilitated by a tab 261 projecting from the top of the container of the drive 49 and moreover causes the disconnection of the connectors of the computer and the drive 49.

The computer 21 may be supplied from the external power supply 75, either for normal operation or to recharge the batteries inserted in the housing 59, through the recharging circuit 61.

With reference to Figure 6, the power supply 75 comprises a section 267 which can be connected to the mains and a section 268 which can be connected to the electronic unit 23 and electrically insulated. The section 267 has a filter circuit 269, a primary rectifier circuit 271, an insulation transformer 272, a pulse-modulation type (PWM) control circuit 273 and a regulating circuit 274 for the output power. The section 268 has a filter circuit 275 and a secondary rectifier circuit 276 connected to a control circuit 277 for output voltage and a control circuit 278 for output current. An opto-insulating circuit 279 connects circuit 273 to circuits 277 and 278, insulating them electrically.

The regulating circuit 274 can be regulated for two different maximum values for output power, in relation to an internal reference voltage, or in relation to a reduced voltage value V_r at its input 281, connected to the microswitch 210. In the absence of voltage at the input 281, the maximum power that can be delivered $W_o \text{ Max}$ corresponds to a standard value STD. When the input 281 instead receives the voltage V_r , the maximum power that can be delivered $W_o \text{ Max}$ is reduced to about 0.4.STD. The dissipated power inside the power supply 75 will be reduced accordingly.

The circuit 277 maintains the output voltage V_o constant, until the output power W_o reaches its maximum value STD or 0.4.STD. Above these values, the voltage V_o gradually falls as the absorption by the va-

rious components of the computer 21 increases, starting from current values I_1 and I_2 , in accordance with the curves A (standard power) and B (reduced power) on the graph in Figure 7. The circuit 278 finally limits the output current to a maximum value I_{max} and then brings the voltage V_o to zero, in accordance with the curve C, and maintains it at zero, until the power supply is switched off and switched on again, in a manner which is per se known.

The power supply 75 is rated so that, in a condition of maximum power delivery and when it is removed from the housing 201, as shown in Figure 2, the dissipated heat is such that very low overheating temperatures are reached in its internal components and on the external surface. These values would be unacceptable if the maximum power were delivered when the power supply was inserted in the housing 201. The terminal of the regulating circuit 281 is appropriately connected to the microswitch 210, to receive the reduced reference voltage V_r , when the power supply 75 is inserted in the housing 201. This makes it possible to limit the excess temperature of the components of the power supply 75 within normal values.

The actual consequences of a reduced delivery of supply power are negligible in the computer 21. If the batteries 58 are discharged, the supply at reduced power only causes an increase in the battery recharging time.

Claims

1. A portable electronic computer comprising a base (22) with an electronic unit (23) for managing the computer's functions, a housing (201) for accommodating a disk drive (52) for reading/writing disk storage and which can be supplied from an external power supply (75), characterized in that the housing can accommodate at least part of the above-mentioned power supply instead of the disk drive.
2. A portable electronic computer according to claim 1, characterized in that the housing (201) is located on the bottom of the base (22), at the rear.
3. A portable electronic computer according to claim 2, characterized in that the power supply comprises a part which projects in relation to an insertable part (202) and in that the projecting part is substantially trapezoidal in section, so that the computer assumes an angled position in relation to the plane of support.
4. A portable electronic computer according to claim 3, characterized by an extension (204) which can be extracted from the projecting part (203) and

which, together with the bottom of the computer in an area adjacent to the housing, improves the stability of the computer on the plane of support.

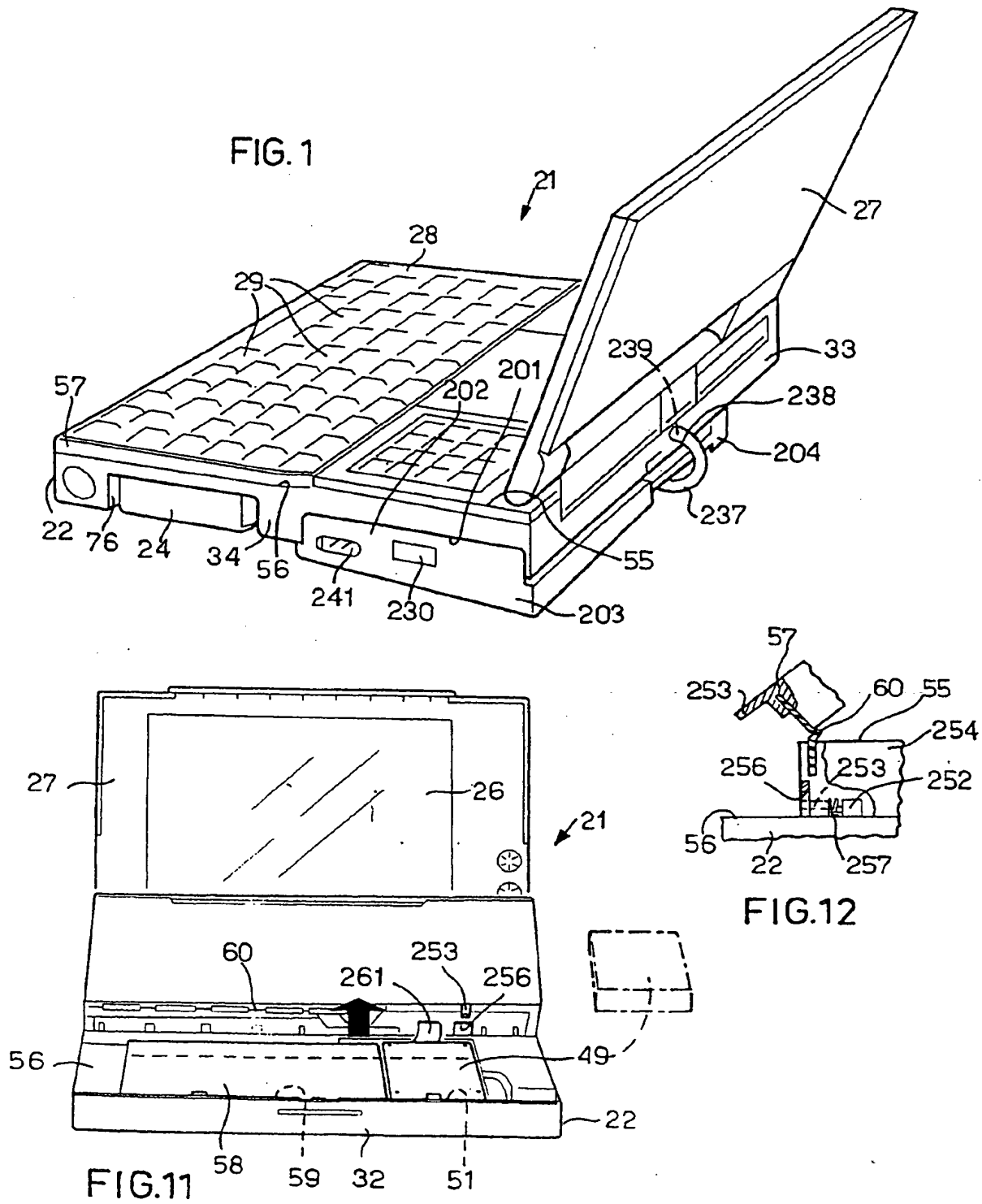
5. A portable electronic computer according to any preceding claim, characterized by a disk connector located on the bottom of the above-mentioned housing, which is coupled to a connector of the disk drive to form an operative connection between the disk drive and the electronic unit. 5 10
6. A portable electronic computer according to any preceding claim, characterized by guides (216, 217, 231/2) for unambiguously guiding the disk drive or power supply to its operative position. 15
7. A portable electronic computer according to any preceding claim, characterized by means of attachment (208) adjacent to the said housing, for matching means of attachment (209,236) of either the disk drive or the external power supply. 20
8. A portable electronic computer according to claim 7, characterized in that the guides and means of attachment comprise a pin-slot connection between the disk drive or power supply and the parts of the said housing and corresponding means in the disk drive or power supply and in the housing. 25 30
9. A portable electronic computer according to any preceding claim, characterized by a supply socket (239) on the base and by the fact that the said power socket can accommodate a plug (238) of the external power supply, when the power supply is inserted in the housing. 35
10. A portable electronic computer according to any preceding claim, wherein the power supply can supply the computer with a standard output power, characterized by switching means (210) which can be enabled in order to provide a condition of reduced output power in comparison to the standard power, and by means (274) sensitive to the insertion of the power supply in the housing for enabling the means for the reduced output power condition. 40 45
11. A portable electronic computer according to any preceding claims, which can receive an independent power supply by means of rechargeable batteries (58), characterized by a recharging circuit (61), which can be supplied by the external power supply (75) connected to the computer either when it is inserted in the housing or when it is removed from it, and in which the circuit recharges the batteries inserted in the computer. 50 55

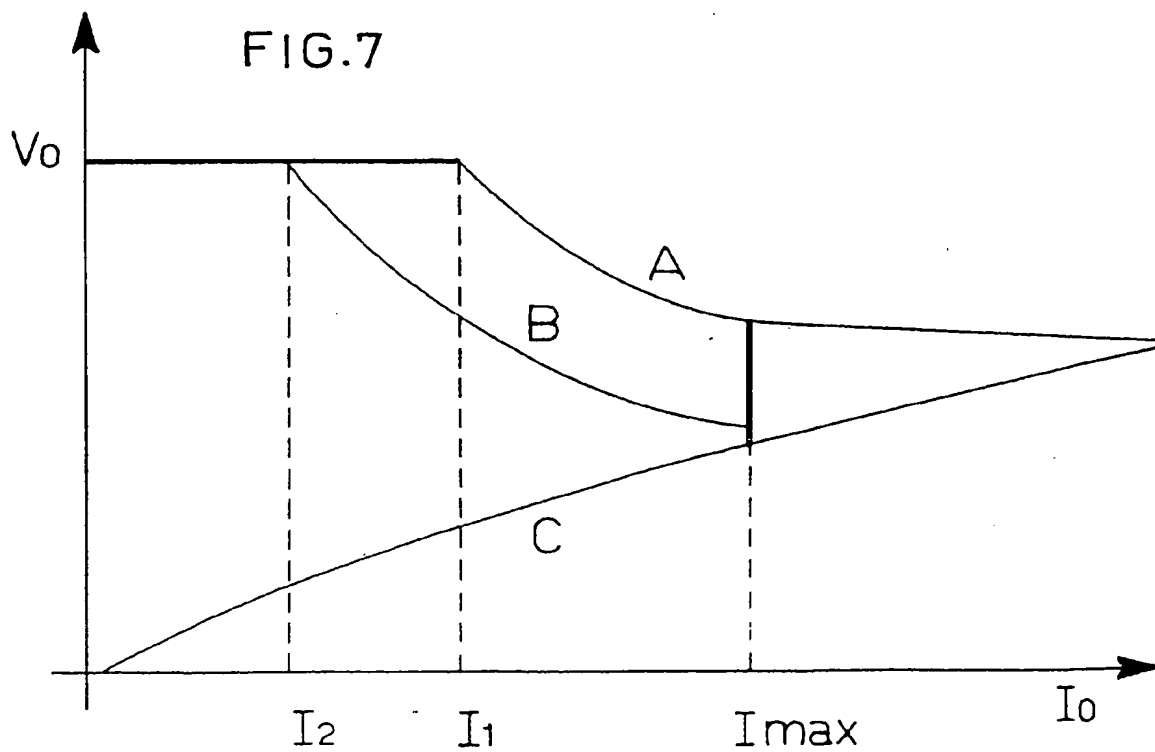
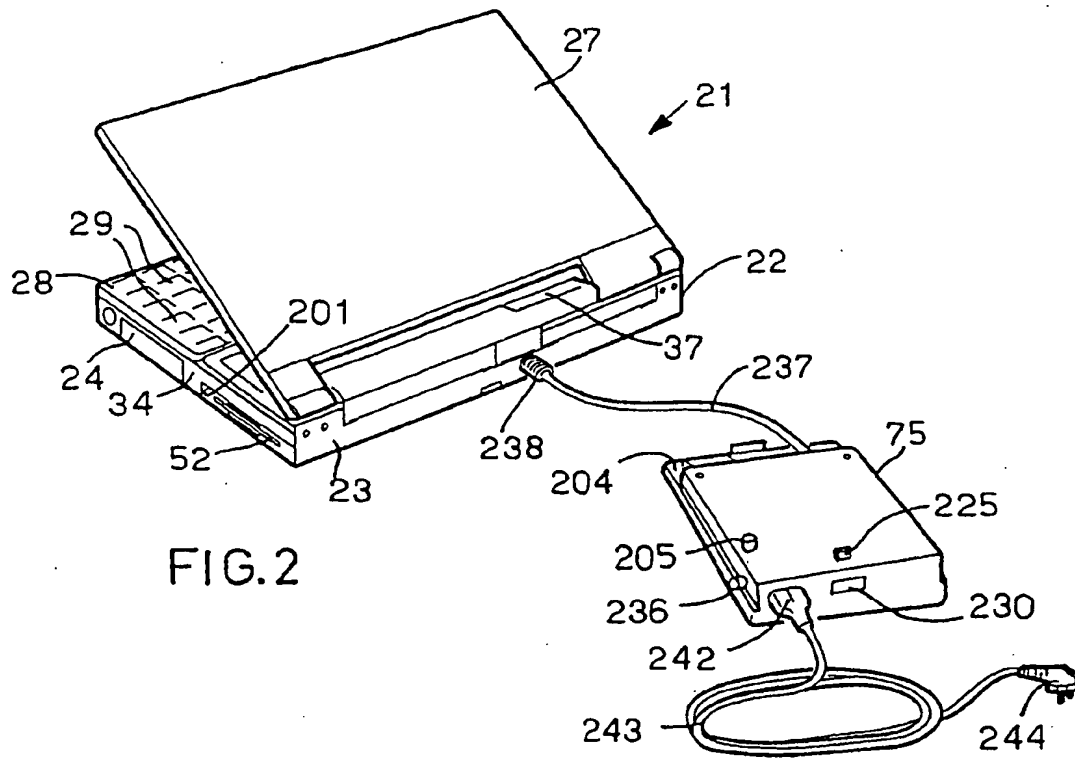
12. A portable electronic computer comprising a base (22) with an electronic unit (23) for controlling and managing its functions, a keyboard (28) and a housing (51) for accommodating a disk drive (49) for reading/writing disk storage, characterized that the housing is at the top of the base and the keyboard (28) can be moved from a working position in which it is superimposed over the housing, to a removal position in which it permits access to the disc drive, and in that there are detection systems (252) sensitive to the working position of the keyboard, and control systems (41) connected to the detection systems so that the electronic unit allows the disk drive to be in an operative condition only when the said keyboard is in the working position.

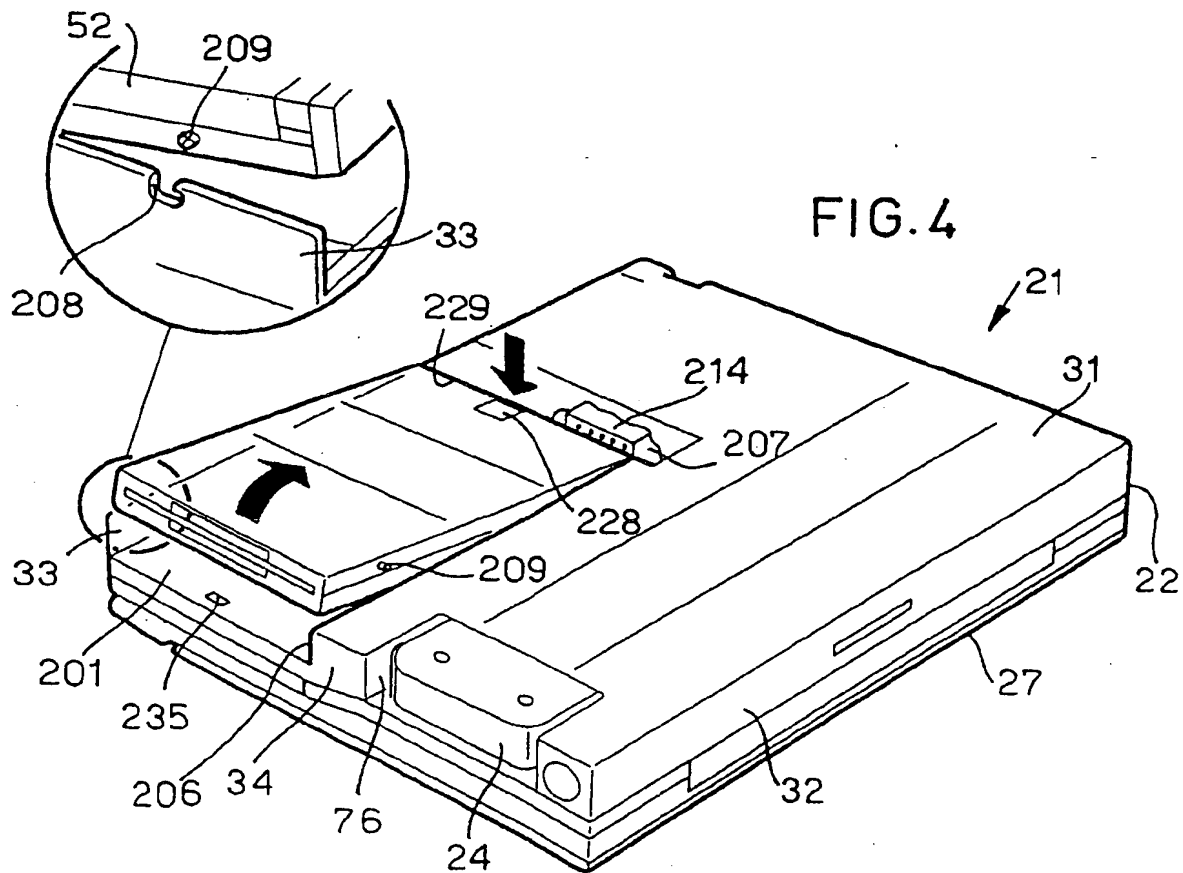
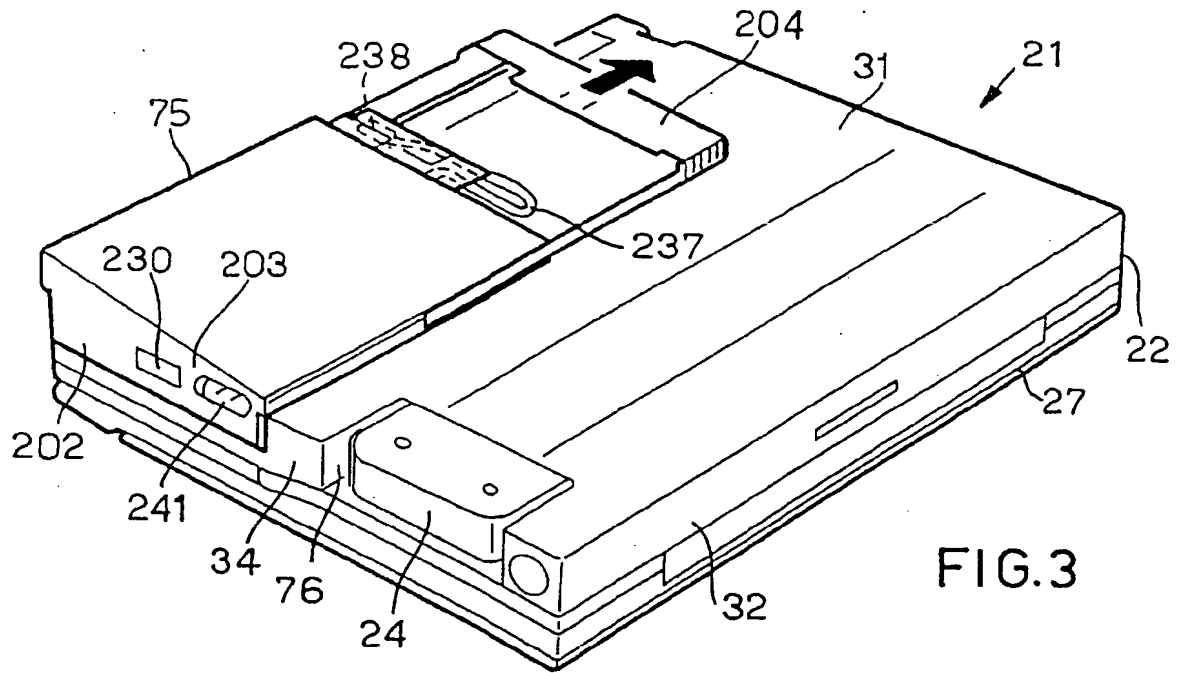
13. A portable electronic computer according to claim 12, characterised in that the housing (59) is adjacent to a battery housing for rechargeable batteries (58).

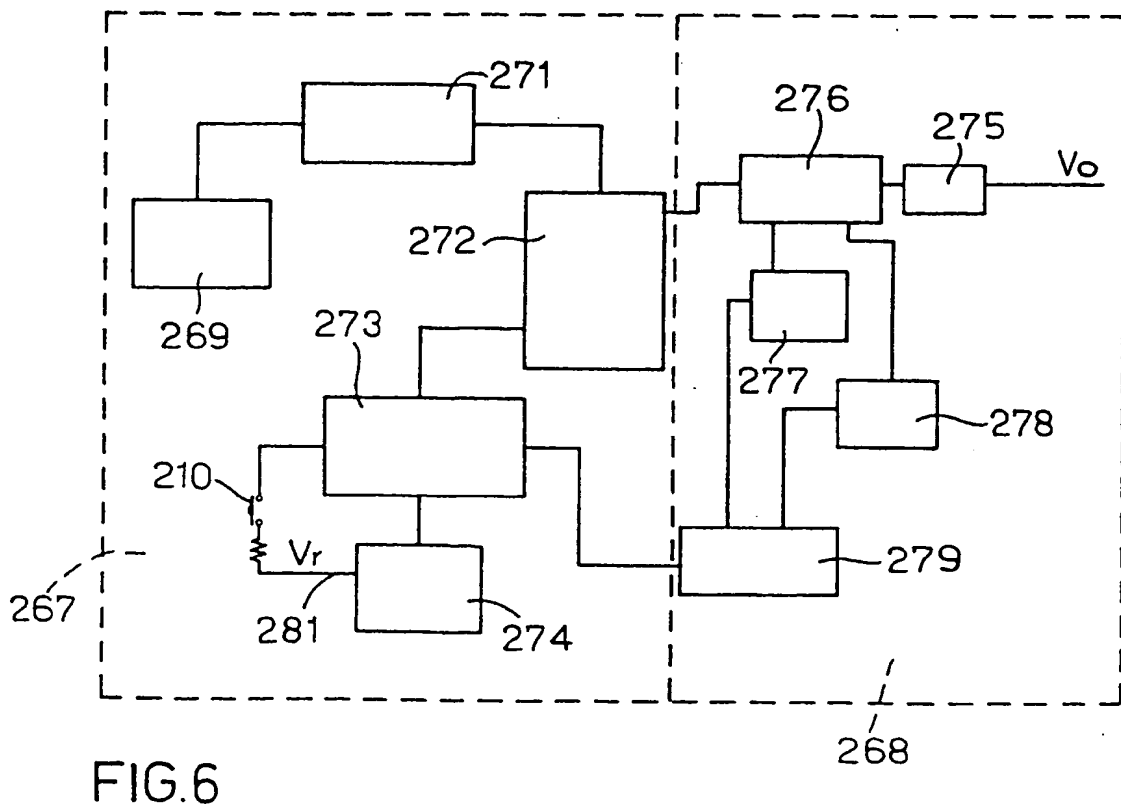
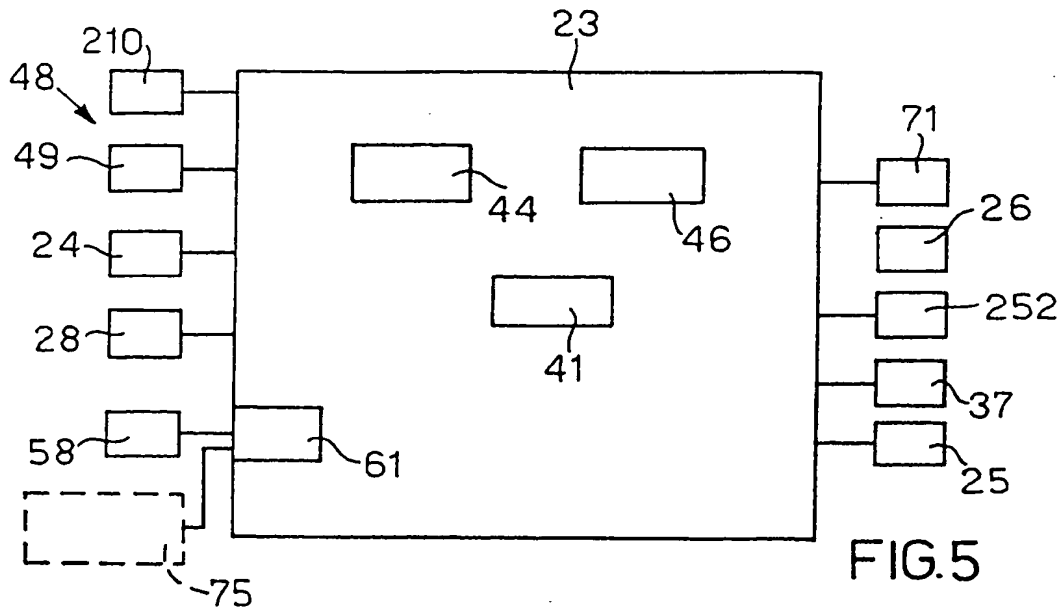
14. A portable electronic computer according to claim 12 or 13, characterized in that the detection systems comprise a microswitch (252) which can be activated by parts of the keyboard, when the keyboard is in the working position.

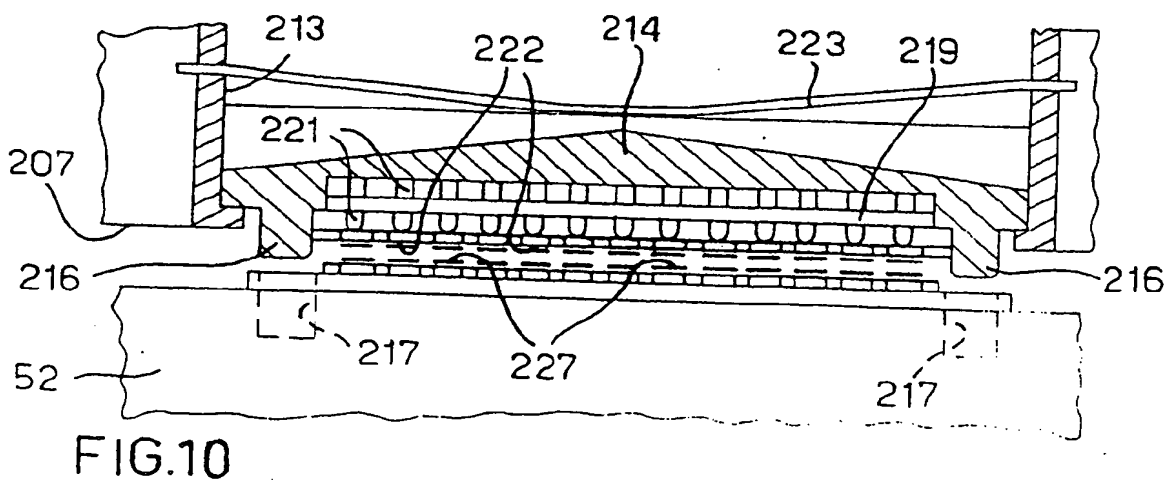
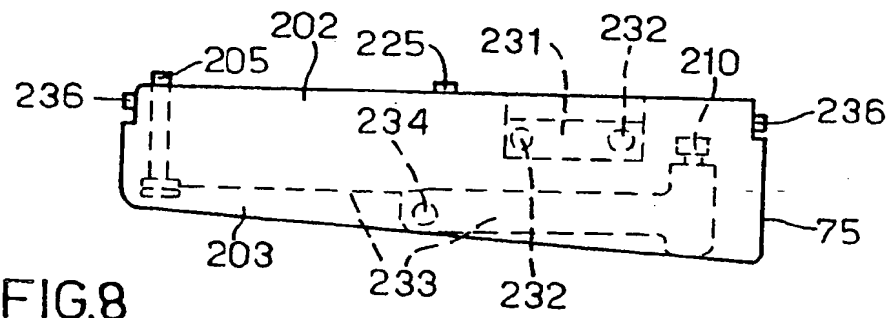
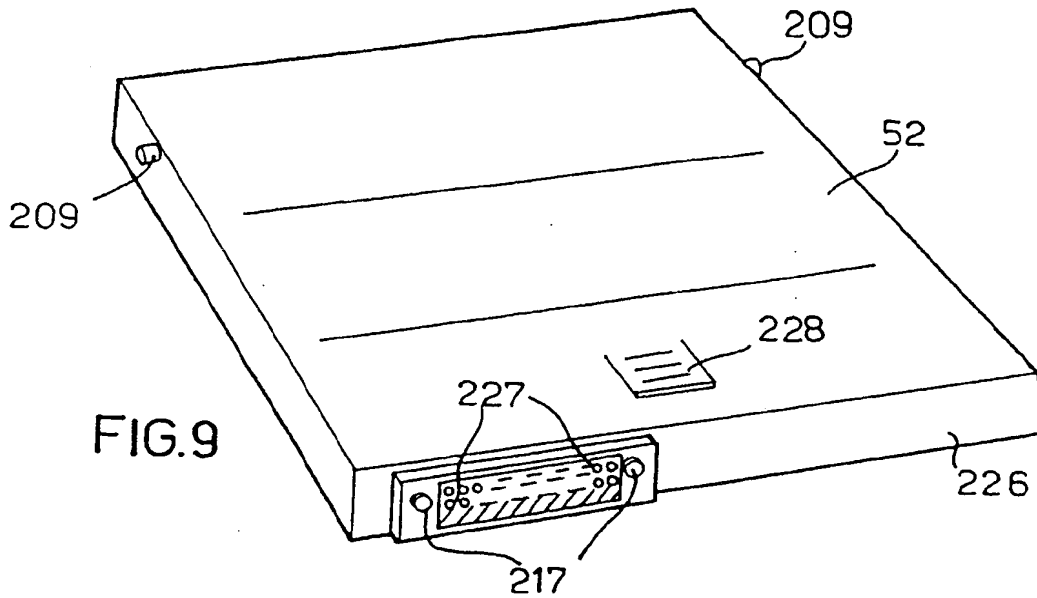
15. A portable electronic computer according to any one of claims 11 to 13, characterized in that the means of control operate on the electronic unit to store in memory volatile data of the computer in the disk drive and to set the disk drive in a safe removal state.











(19)



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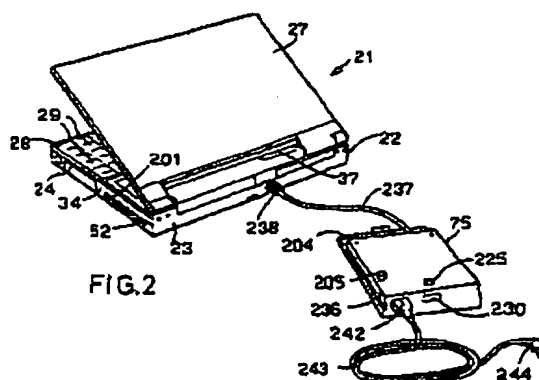


FIG. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 94 30 1722

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	EP-A-0 463 585 (TOSHIBA) * abstract; claims *	1,2	G06F1/16
Y	WO-A-91 17493 (GRID SYSTEMS CORP.) * abstract; claims 15-17; figure 1 *	1,2	
Y	US-A-4 894 792 (MITCHELL ET AL.) * the whole document *	1,2	
Y	WO-A-90 16094 (GRID SYSTEMS CORP.) * page 1, line 32 - page 2, line 16 *	1,2	
A	US-A-4 991 058 (WATKINS ET AL.) * the whole document *	1	
Y	FR-A-2 584 211 (C.G.A. ALCATEL) * claims 1-4; figures 1,2 *	12,13	
Y	US-A-5 132 876 (MA) * the whole document *	12,13	TECHNICAL FIELDS SEARCHED (Int.Cl.6) G06F
A	WO-A-90 00304 (NCR CORP.) * abstract; claim 1 *	12,14	
A	EP-A-0 364 119 (COMPAQ COMPUTER CORP.) * the whole document *	12	
A	IBM TECHNICAL DISCLOSURE BULLETIN., vol.29, no.8, January 1987, NEW YORK US pages 3491 - 3492 'Access method for feature expansion' * the whole document *	12	
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 26 September 1994	Searcher Durand, J
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if considered with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, not published on, or after the filing date D : document cited in the application L : document cited for other reasons A : number of the same patent family, corresponding document	

EP 0 618 525 A3 (PCT)



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EP 94301722

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ All claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for all claims.
- ☐ Only part of the claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claims:
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

X LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims 1-8: Portable computer with housing accomodating either disk drive or power supply.
2. Claim 9: Portable computer with supply socket accomodating a plug for external power supply.
3. Claim 10: Portable computer with reduced power mode upon detection of external power supply.
4. Claim 11: Portable computer with battery recharging circuit able to work either in or outside of the computer.
5. Claims 12-15: Portable computer with removable disk drive situated under the keyboard.

- ☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☒ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
1-8
12-15
- ☐ None of the further search fees has been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

